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MINISTRY OF FOOD AND AGRICULTURE, GOVERNMENT OF INDIA

PLANT PROTECTION BULLETIN

SCIENCE IN PRACTICE

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ARE OUR CITRUS ORCHARDS FREE FROM QUICK DECLINE?

By

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Quick decline is now widely recognized as a serious disease of citrus, particularly that of sweet orange on sour orange root-stock. The presence of this disease in India is doubtful or at least it has not been properly investigated. Some sort of 'decline' has been reported from certain South Indian States but the nature of the trouble is not clearly known. It may be useful to give a brief description of the disease as it occurs in foreign countries with a view to help in an accurate determination of this wide-spreading malady in Indian citrus orchards, if present, and in guarding against the introduction of the disease, if not yet known to occur in this country.

Occurrence

The disease was first recognized in South Africa in late 1820 when it was observed that sweet orange and mandarin trees budded on sour orange root-stock usually succumbed within 2 or 3 years. A similar disease was noted in Java in 1928 and in Argentine about 1930. In Brazil the disease, which is known there by the name 'tristeza', was first recorded about 1937 and is now of widespread occurrence in that country. In the United States of America quick decline was first discovered in Sourthern California in 1939; it was not reported from any other State in that country until recently when evidence of the presence of the disease was indicated in certain citrus orchards in Louisiana and Florida.

Distinguishing Characteristics

Symptoms of quick decline resemble those produced by severe girdling of trees or those of advanced stages of certain root rots. Most commonly the affected trees show a gradual top decline but younger trees sometimes wilt quite suddenly. The first symptom of disease on slow declining trees is a lack of new growth during a normal flush period. The mature leaves develop a dull ashen or slightly bronzed colour, later turning more yellow. Trees may fruit rather heavily before the foliage symptoms appear but such fruit colours prematurely. A heavy crop of prematurely coloured fruit is usually the first indication that the tree will later decline. Trees showing slow decline lose their leaves gradually. They may lose nearly all leaves

over a period of several weeks but mostly they begin to produce new leaf growth before they are completely defoliated. When such affected trees begin to make a new growth they are described as having reached an equilibrium or partial recovery stage. Such recovered trees, which usually produce poor yield, may decline again on exposure to unfavourable environmental conditions. Very young trees, if infected with quick decline, produce a very heavy crop of fruit at a much earlier age as compared to healthy ones.

It is now known that the top symptoms of the disease are caused by the rotting of the roots which is a result of starvation. When the supply of stored food is depleted, the roots cannot get sufficient food for their maintenance and growth processes. Such roots are then predisposed to attack by numerous bacteria and fungi. The trees begin to exhibit foliage symptoms when the root system is destroyed enough to prevent the supply of sufficient water to the tops.

Nature and transmission

A number of theories had been advocated in the past to explain the failure of certain citrus varieties on sour orange root-stock, namely, scion stock incompatibility, nutrient deficiencies or excesses, soil moisture relationships, nematodes, pathogenic organisms, soil acidity and viruses. First evidence of the disease as being of virus nature was obtained in the middle of 1946 at the California Citrus Experiment Station; it was fully substantiated in subsequent tests. 'Tristeza' was also reported to be a virus disease from Brazil in late 1946.

The disease is transmissible by graft-union only and its natural spread occurs by means of insect vectors. In Brazil, Java, South Africa and West Africa, the disease is probably transmitted by the aphid *Aphis citricidus*. In U.S.A., however, where this species had not been recorded, another aphid *Aphis gossypii* has been found to transmit the virus to some extent.

It has recently been shown that the so-called stem-pitting disease of grape fruit, tristeza and quick decline are all one and the same disease and are caused by the same virus.

Stock-Scion relationship and varietal response

Sweet orange on sour orange rootstock has been definitely found to be affected by quick decline. Other citrus types such as grape fruit, pummelo, shaddock, some acid lemons and limes and some tangelos are susceptible and are unsatisfactory as rootstocks in areas where quick decline is known to occur. The combinations of sweet orange on rootstocks of sweet orange, rough lemon, trifoliate orange, some citrumelos and mandarins are apparently unaffected under field conditions. These rootstocks are tolerant to the virus and are most likely to be satisfactory in localities where quick decline occurs. Quick decline symptoms have not been noticed on lemon trees regardless of the rootstock on which they are growing.

It is now known that sweet orange tops on sweet orange root-stocks could act as carriers of the virus even without showing any visible symptons. It is, therefore, apparent that such rootstock-scion combinations might transfer the disease from affected to disease-free localities. This is very important from quarantine stand-point, since there is no rapid means of discovering that the apparently healthy plant material carried a virus which could cause great loss to the citrus industry.

Detection of disease

Two methods have generally been used for detecting the presence of quick decline in areas where the disease has not been recognized.

(i) *Anatomical diagnosis of bark samples*—Bark samples for anatomical study are taken from the point of union of the scion and the root-stock. The presence of sieve tube necrosis below the bud union and the characteristic anatomical changes occurring secondary to the necrosis have been valuable in the diagnosis of quick decline[1]. The diagnosis is considered as positive decline or possible decline depending on whether the characteristic secondary anatomical changes are more intense or less intense. The results are considered negative if the phloem at the bud union is normal. If the sieve tube necrosis is present but the secondary anatomical changes are absent, the diagnosis is considered indetermined.

(ii) *Use of test plants*—Certain species and varieties of citrus that show symptoms of quick decline as seedlings, such as West Indian lime, grape fruit, some tangelos, pummelos and some acid lemons, are used as test plants for the detection of the presence of the quick decline virus, since these seedlings show on inoculation more specific symptoms (*i.e.*, vein clearing and stem-pitting) than sweet orange trees on sour orange root-stock, and within a much shorter period. Twigs from trees affected with unidentified or suspected declines are grafted into the stems of healthy test plants by the bottle graft method. The cut end of the twigs are immersed in vials of water until the union is effected. Within about 4 months the inoculated plants show first vein-clearing on leaves.

Though anatomical diagnosis of bark samples is a useful and quick means of obtaining an indication of the presence of quick decline, transmission of the virus to healthy test plants such as the West Indian lime seedlings, is considered important for confirming the diagnosis.

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[1] Schneider, Henry, J. M. Wallace and J. E. Dimitan (1950). The pathological anatomy of bud union tissues of orange trees and its value in the diagnosis of quick decline, "Phytopathology" *40* : 24.

Prevention

The use of resistant scion-stock combination is the only certain means of prevention against quick decline. However, such control is not possible where susceptible combinations already comprise large part of the citrus plantings. Efforts to reduce the effects of the disease on the affected trees by the application of soil amendments and various fertilizers and by injection of both the trees and the soil with various chemical disinfectants, vitamins, sulpha-compounds, etc. have failed. There is little hope of practical control or prevention of the disease by controlling the insect vectors which exist in such large numbers.

As the rate of spread and increase of quick decline into previously disease-free plantings is rather slow, removal of affected trees as soon as they are detected proves valuable. Such a roguing eliminates some of the sources of virus and retards the incidence of the disease. The replacement of quick decline trees with tolerant combinations, as the diseased trees appear, and the removal and replanting of other unproductive trees generally help in keeping orchards in continuous production.

Another important step in the reduction of losses is the establishment of effective methods of bud certification. Such a system is in operation in the State of California in U.S.A.

NEW INSECTICIDES, HERBICIDES AND RODENTICIDES*

I. Insecticides

Perthane†—Rohm and Haas Company of Philadelphia of U.S.A. have announced the availability of a new agricultural insecticide "Perthane" described as a technical grade of ethane which is stated to be of a low order of mammalian toxicity, and to be chemically stable both in the technical grade and in formulation. The manufacturers state that excellent control has been obtained against a number of insects. They quote the following experimental results in support of their claim that there is an adequate safety margin in the use of this insecticide:

Acute oral LD-50	rats 8170 ± 500 mg/kg. mice 9340 ± 120 mg/kg.
Chronic percutaneous toxicity	3 cc/kg of 30 per cent "Perthane" in dimethyl phthalate by daily injections was tolerated for 13 weeks by rabbits.
Chronic oral toxicity	Two year feeding tests with rats at 100, 500, 1,000, 2,500 and 5,000 ppm have now gone through the 15th month and no adverse effects on survival or rate of growth have been noted at any level.
	Rats fed 50 ppm radioactive "Perthane" in the diet for six weeks showed 19 ppm in the fat.

Sytam‡—Though based upon Schradan, *Sytam,* a new British systemic insecticide, is claimed to differ by reason of its special manufacturing process. It is reported that while other and previous processes yield a technical Schradan—containing from 25 per cent. to 39 per cent. of TPD (triphosphoric pentadimethylamide) as an impurity, very small proportions of this impurity are formed in the new process. Sytam has a higher stability as a result, for TPD hydrolyses much more rapidly than Schradan. It is also reported that activating substances would be inhibited if TPD was heavily present. Sytam has no contact insecticidal activity; its *modus operandi* is wholly systemic.

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* Compiled by Dr. V. P. Rao, Assistant Director (Foreign Quarantines), from recent literature.

† Agricultural Chemicals, Vol. 8, No. 6, p. 47, 1953.

‡ Manufacturing Chemist, Vol. 24, No. 5, p. 205, 1953.

II. Herbicides

Tumble-Weed 25*—Eston Chemicals Division of American Potash and Chemical Corporation of U.S.A. are offering a nonselective herbicide under the trade name Tumble-Weed 25, said to have wide use as a weed killer and soil sterilant. The herbicide contains 25 per cent. sodium chlorate and 75 per cent soluble borates, including a wetting and spreading agent. It contains 97 per cent. active agent. Properly applied, it is said to kill weeds and grasses and leave the soil sterile for a year or longer. As a general weed-killer it can be applied to both broad-leaf and narrow-leaf types of weeds and grasses.

Phenyldimethylurea†—E. I. Dupont de Nemours & Co. of U.S.A. have placed in the market Phenyldimethylurea a herbicide which is specifically promising for the control of deep-rooted perennial weeds and yet be reduced to innocuous levels in the soil in a reasonable period of time.

Phenyldimethylurea is a white, crystalline compound having a melting point of 127°—129°. It is sparingly soluble in hydrocarbon solvents and is soluble in water at 24°C. to the extent of 0.29 per cent. Acute oral toxicity determinations on white rats reveal an approximate lethal dose of 7,500 mg./kg. The inclusion of phenyldimethylurea in the diet to the extent of 0.05 per cent for 90 days had no apparent adverse effect on white rats.

III. Rodenticides

Coumachlor‡—This is the new rodenticide containing 3-(a-acetonyl-4-Chlorobenzyl)-4-hydroxycoumarin. Coumachlor has anticoagulant properties similar to dicumarol. Experiments have indicated that when used in concentrations of 0.25 per cent. with suitable bait material it is effective in controlling rats and mice. Unlike rodenticides used previously in baits and like Warfarin, rats and mice do not develop shyness to Coumachlor.

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* Chemical and Engineering News, Vol. 31, No. 3, p. 278, 1953.

† Agricultural News Letter (E. I. Dupont Nemours & Co.), Vol. 21, No. 6, p. 103, 1953.

‡ Agricultural and Food Chemistry, Vol. I, No. 12, p. 753, 1953.

RULES FOR REGULATING THE IMPORT OF AMERICAN COTTON INTO INDIA

(Notification No. 1581, Agric dated the 1st October 1931 corrected upto 12th January 1953)

In exercise of the powers confered by sub-section (1) of Section 3 of the Destructive Insects and Pests Act, 1914 (II of 1914), hereinafter referred to as the said Act, and in supersession of the notification of the Government of India in the Department of Education, Health and Lands, Nos. 1493, dated the 14th November 1925 and 1561, dated the 26th November 1925, and of all notifications amending the same, the Governor-General-in-Council is pleased to issue the following order for the purpose of regulating the import into India of American Cotton or West Indies Cotton :—

1. In this order:—

(i) "Cotton" includes ginned cotton, and droppings, strippings, fly and other waste products of a cotton mill other than yarn waste, but does not include cotton seed or unginned cotton,

(ii) "American Cotton" means all cotton produced in any part of America,

(iii) "Bale" means any pressed package of cotton of whatever size or density,

(iv) "Square Bale" means a bale of a weight exceeding 270 lbs.,

(v) "Round Bale" means a bale of a weight not exceeding 270 lbs.,

(vi) "West Indies Cotton" means all cotton produced in any part of West Indies.

2. American cotton or West Indies cotton shall not be imported into India by means of the letter or sample post or as passengers' accompanied baggage and shall not be imported by any other means save through the port of Bombay or Madras and subject to the following conditions:—

(a) On or before the departure of a ship carrying a consignment of American cotton or West Indies cotton for Bombay or Madras from the port from which the cotton is consigned, the consignee shall ascertain the name of the ship, the probable date of its arrival in Bombay or Madras, and the number of bales of American or West Indies cotton contained in the consignment, and shall furnish this information to the Collector of Customs, Bombay and to the Quarantine Entomologist, Directorate of Plant Protection, Quarantine & Storage, Yusuf Building, Churchgate St., Bombay or, as the case may be, to the Traffic Manager of the Madras Port Trust and the Entomologist, the Harbour, Madras not less than 14 days before the arrival of the ship at Bombay or Madras provided that where the cotton is loaded for Bombay at Port Said or at a European port the ordinary length of voyage from which is less than three

weeks, it shall be sufficient to furnish the information not less than ten days before the arrival of the ship at Bombay.

(b) On arrival at Bombay or Madras, the cotton shall be disinfected in such manner as shall be prescribed in rules made by the Government of Bombay or, as the case may be, the Government of Madras under section 5 of the said Act.

(c) Prior to taking delivery of the cotton the importer shall pay to the Collector of Customs, Bombay or Madras in accordance with such instructions as may be issued by him a sum at the rate hereinafter provided, which shall cover the cost of fumigation, including the cost of loading the cotton into the barge, conveyance to the fumigation wharf or bunder, unloading from the barge after fumigation and delivery at the bunder, but not including docks import charges as specified in the Bombay Port Trust or, as the case may be, the Madras Port Trust Scale of Rates charged at the docks.

Provided that samples of American cotton or West Indies cotton imported by parcel post or as ship's parcels, not exceeding 20 lbs. each in weight shall be fumigated free of cost in the fumigation Chamber of the Bombay Customs House or, as the case may be, the Madras Customs House;

Provided further that the Collector of Customs, Bombay or, as the case may be, the Docks Manager of the Madras Port Trust in accordance with any general or special orders of the Central Government for the time being in force, remit or refund, in whole or in part, any sum which under this order is payable or has been paid on any consignment of American cotton or West Indies cotton;

(d) No vessel shall discharge American cotton or West Indies cotton during a period of rain, mist or drizzle.

3. The rate referred to in clause (c) of paragraph 2 shall be Rs. 5-4-0 per square bale and Rs. 3-4-0 per round bale, or when cotton is landed at the special American cotton or West Indies cotton wharf in the Bombay or Madras Docks Rs. 7-7-0 per square bale and Rs. 5-0-0 per round bale:

Provided as follows:—

(i) in cases in which the importer has failed to furnish information in accordance with clause (a) of paragraph 2 each of the rates hereinbefore prescribed shall be increased by Rs. 2 per bale;

(ii) the minimum fee for the fumigation of any cotton imported at any one time on a single ship shall be rupees two hundred and ten, and when such minimum fee is leviable it shall, if there is more than one consignee, be distributed among the consignees in proportion to the amount of their respective consignments.

RULES FOR REGULATING THE IMPORT OF FUNGI INTO INDIA

(Department of Education, Health and Lands Notification No. F.16-5 (I)/43-A, New Delhi, the 10th May 1943. Corrected upto the 28th January 1952)

In exercise of the powers conferred by sub-section (1) of section 3 of the Destructive Insects and Pests Act, 1914 (II of 1914), the Central Government is pleased to make the following order for the purpose of prohibiting, regulating and restricting the import of live fungi into India:—

1. In this order, "fungus" means any living fungus in culture media or on living plants or any fungus spores or mycelium intended to be so cultured, but excludes dried specimens not intended to be so used.

2. No fungus shall be imported into India unless—

(a) it is consigned to the Head of Division if Mycology, Indian Agricultural Research Institute, New Delhi, Forest Mycologist, Forest Research Institute, Dehra Dun; or

(b) it is accompanied by a special permit, in accordance with the form set forth in the Schedule to this order authorising such importation issued by the Head of Division of Mycology, Indian Agricultural Research Institute, New Delhi or Forest Mycologist, Forest Research Institute, Dehra Dun:

Provided that a permit shall not be refused in respect of any fungus which is not, in the opinion of the Head of Division of Mycology, Indian Agricultural Research Institute, New Delhi or Forest Mycologist, Forest Research Institute, Dehra Dun, likely to cause infection to any crop.

3. This order shall come into force with effect from the 1st September 1943.

Schedule

Form of special permit authorising importation of living fungi in pure culture.

1. Name, designation and full address of the importer.....

.....

2. Name of the fungus to be imported.....

3. Country from which importation is sought.....

4. Whether importation is intended by sea, land or air.....

5. Whether in its original home the fungus is a parasite, and if so, the name of the host plant.....

6. Name, designation and address of the exporter.....

7. Purpose of importation .....

The above information is true to the best of my belief.

Date..... (Signature of the importer)

I authorise the importation. This permit will be valid upto.....

Date..... (Signature of Head of Division of Mycology)

N.B.—The permit must be obtained in advance of sending the order. The tubes or other container of the fungus must be clearly and distinctly marked with the name of the fungus, which should agree with the name on the import permit.

RULES FOR REGULATING THE IMPORT OF INSECTS INTO INDIA

(Department of Education, Health and Lands Notification No. F.193/40A, New Delhi, the 3rd February 1941. Corrected upto the 11th June 1951)

In exercise of the powers conferred by sub-section (1) of section 3 of the Destructive Insects and Pests Act, 1914 (II of 1914), the Central Government is pleased to make the following order for the purpose of prohibiting, regulating and restricting the import of live insects into India:—

1. In this order "insect" means a living insect, and includes eggs of an insect,

2. No insect shall be imported into India unless it is accompanied by—

(a) a special permit in accordance with the form set forth in the Schedule to this order, authorising such importation issued by the Central Government or by an Officer authorised by the Central Government in this behalf: provided that a permit shall not be refused in the case of any insect which, in healthy condition, is not likely to be destructive to crops; and

(b) a certificate of freedom from disease granted by an Entomologist of the Government of the country of origin.

3. The provisions of paragraph 2 of this Order shall not apply to—

(a) bees and silkworms;

(b) parasites and destroyers of injurious insects or other pests intended for the control of such insects or pests, when imported by the authorities of the Institution named below:—

The Indian Agricultural Research Institute, New Delhi.

The Indian Veterinary Research Institute, Mukteswar.

The Forest Research Institute and College, Dehra Dun.

The Public Health Commissioner with the Government of India.

The Indian Research Fund Association.

The Departments of Agriculture, Madras, Bombay, West Bengal, Uttar Pradesh, Punjab (I), Bihar, Madhya Pradesh, Assam, Orissa, Jammu and Kashmir and Mysore.

Schedule

Form of special permit authorising importation of insects

1. Name and designation and full address of the importer.....
.....
2. Name of the insect species to be imported.....
3. Stage or stages of the insect to be imported.....
4. Country from which importation is sought.....
5. Whether importation is intended by sea, land or air.....
6. Whether in its original home it is a weed pest, parasite or a predator.....
7. (i) Name (names) of the weed (weeds) on which it is a pest in the country of origin .....
   (ii) Name (names) of the pest (pests) on which it is a parasite or predator in the country of origin .....
8. Name, designation and address of the exporter .....
.....
9. Quantity indented for .....
10. Purpose of importation .....

The above information is true to the best of my belief.

Date..... (Signature of the importer)

I authorise the importation. This permit will be valid upto.....
.....

Date.....

(Signature and designation of the certifying authority)

N.B.—It is expected that the permit will be obtained in advance of sending the order so that the imported material may not remain indefinitely in the warehouse for want of suitable permit.

SUMMARY OF PLANT QUARANTINE REGULATIONS OF IRAN*

Legislation

Decree of Council of Ministers, of 2 September 1946.

General Restrictions

Import authorization—Import of all kinds of plants, seeds, bulbs, roots, cuttings, grafts, fruits and other vegetative parts of plants used for propagation requires previous authorization of the Ministry of Agriculture. Seeds, bulbs or ornamental plants sent as a gift from foreign countries without a phytosanitary certificate, shall be held by the Customs Offices until inspection is made by the Department of Plant Protection.

Points of entry—Khorramshahr, Pahlavi and Ghasreshirin are at present authorized for inspection and release of agricultural products. Products landed by planes in Tehran and those which are sent on customs permit to Tehran shall be inspected at Tehran.

Certificates—All agricultural products imported into the country must be accompanied by a phytosanitary certificate and, if required, a certificate of disinfection, issued by recognized institutions in the country of origin.

Inspection and treatment—The Department of Plant Protection is authorized to inspect agricultural products, and in case of infection by quarantine pests and diseases, make necessary treatment for disinfection or order such products to be re-shipped or destroyed.

Importation prohibited

1. *Potatoes from any foreign country*—To prevent the introduction of Colorado Beetle, (*Leptinotarsa decemlineata*), potato tuber worm (*Gnorimoschema operculella*), wart (*Synchytrium endobioticum*) and other pests and diseases of this crop. Small quantities may be imported without permit for local consumption in ports and frontier towns.

2. *Grapevine cuttings, grafts and rooted plants*—To prevent the introduction of grape phylloxera (*Phylloxera vitifoliae*) and other pests and diseases.

3. *Wheat, barley, rice and sorghum for cultivation*—To prevent the introducion of rice smut (*Tilletia horrida*), flag smut of wheat (*Urocystis tritici*) and other cereal diseases.

Cereals for experimental or propagation purposes may be imported by the Ministry of Agriculture in accordance with established regulations.

4. *Living insects of all kinds*—Except that the Department of Plant Protection may import useful living insects.

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* Extract from Digest of Plant Quarantine Regulations, F.A.O. Development Paper No. 23, pp. 83–85, 1952.

Importation restricted

1. *Cotton, including cotton seed, lint, unginned cotton and other parts of cotton plants*—Importation is prohibited on account of dangerous cotton pests, such as pink boll worm (*Pectinophora gossypiella*) and boll weevil (*Anthonomus grandis*), except for the following cases:

(a) Cotton seed may be imported by the Ministry of Agriculture or other government institutions, subject to: (i) previous authorization by the Department of Plant Protection; (ii) inspection; and (iii) authorization in selecting planting site and control of the crop by the Department.

(b) Cotton lint may be imported with previous authorization of the Ministry of Agriculture and special decree of the Council of Ministers. The importing government agent shall send to the Department of Plant Protection a copy of the import permit, indicating the country of origin, quantity, and the name of the importer.

Ginned cotton imported from Africa, America and India requires a certificate of disinfection. From other countries, a phytosanitary certificate is sufficient.

(c) Cotton lint and cotton seed in transit. The phytosanitary and disinfection certificates are required. Cotton seed must be packed in double sacks.

2. *Fruit trees, including cuttings, grafts, rooted plants, citrus fruits and other fruits*—Importation is prohibited on account of the mediterranean fruit fly (*Ceratitis capitata*), oriental fruit moth (*Grapholitha molesta*), olive fly (*Dacus oleae*), *citrus canker* (*Bacterium citri*) and other pests and diseases of fruit trees, except for the following cases:

For propagation purpose, government agencies may import the products mentioned above subject to: (i) previous authorization of the Department of Plant Protection; (ii) presentation of phytosanitary certificate or if necessary, disinfection certificate; (iii) inspection and treatment if necessary; (iv) approval by the Department in selecting the planting site. If the importer is not a government agency, in addition to the above requirements, a written application for import authorization must be submitted to the Ministry of Agriculture, indicating the country of origin, kind of products, quantity and planting sites.

3. Ornamental and forest trees, including seeds, plants and cuttings. Subject to the general restrictions.

THE EAST PUNJAB AGRICULTURAL PESTS, DISEASES AND NOXIOUS WEEDS ACT, 1949

East Punjab Act No. IV of 1949

An Act to provide for the prevention of the introduction, spread or reappearance of insect pests, plant diseases and noxious weeds injurious to crops, plants or trees in the Province of East Punjab.

It is hereby enacted as follows:—

PART I—Preliminary

1. *Short title and extent*—(1) This Act may be called the East Punjab Agricultural Pests, Diseases and Noxious Weeds Act, 1949.

(2) It extends to the whole of the Province of East Punjab.

2. *Definitions*—In this Act unless there is anything repugnant in the subject or context—

(1) "Insect Pest" means any insect or other invertebrate animal which has been declared to be an insect pest by notification under section 3;

(2) "Inspector" means an inspector appointed under section 10;

(3) "Notified Area" means any area specified in the notification issued under section 3 in which a declaration made under the said section shall remain in force;

(4) "Noxious weed" means any weed declared to be noxious weed by notification under section 3;

(5) "Occupier" means the person having for the time being the right of occupation of any land or premises or his authorised agent or any person in actual occupation of the land or premises and includes a local authority having such right of occupation or in such actual occupation;

(6) "Plant" includes all agricultural or horticultural crops, trees, bushes or herbs or the seed, fruit or any other part thereof which is used for food of man or beast or for any purpose in connection with art or manufacture;

(7) "Plant disease" means any fungoid, bacterial virus, parasitical or other disease declared to be a plant disease by notification under section 3;

(8) "Prescribed" means prescribed by rules made under this Act.

PART II—Insect Pests, Plant Diseases and Noxious Weeds

3. *Power to declare insect pests, plant diseases and noxious weeds and direct measures to eradicate or prevent them*—Whenever it appears to the Provincial Government that any pest, disease or weed is injurious to plants in any local area and that it is necessary to take measures to eradicate such pest, disease or weed, or to prevent its introduction, spread or reappearance, the Provincial Government, may, by notification in the Official Gazette—

(i) declare that such pest, disease or weed is an insect pest, plant disease or noxious weed;

(ii) specify the local area within which and the period during which such declaration shall remain in force;

(iii) prohibit or restrict the movement or removal of any plant, earth, soil, manure or other thing from one place to another;

(iv) direct the carrying out of such preventive or remedial measures, including the destruction of any insect pest, plant disease or noxious weed or any plants as the Provincial Government may deem necessary, in order to eradicate such pest, disease or weed or to prevent its introduction, spread or reappearance; and

(v) prescribe the period within which it shall not be lawful to plant with a specified crop the whole or any portion of the notified area.

4. *Duties of occupier on the issue or a notification under section 3*—On the issue of a notification under section 3, every occupier within the notified area shall be bound to carry out the preventive or remedial measures mentioned in such notification.

5. *Power of Inspector to enter upon any land or premises*—Any Inspector may, after giving the prescribed notice, enter upon any land or premises, situated in the notified area within his local jurisdiction for the purpose of ascertaining—

(i) whether there is any insect pest, plant disease or noxious weed on such land or premises: and

(ii) whether the preventive or remedial measures or both as the case may require, mentioned in the notification issued under section 3 have been carried out.

6. *Notice to occupier to carry out preventive or remedial measures*—(1) If, on the inspection of any land or premises under section 5, the Inspector finds that there is any insect pest, plant disease or noxious weed on such land or premises and that the preventive or remedial measures mentioned in the notification issued under section 3 have not been carried out, the Inspector may, subject to any general or special orders of the Provincial Government, call upon the occupier of such land or premises, by notice in writing, to carry out such preventive or remedial measures within the time specified in such notice.

(2) Within seven days from the date of the service upon him of the notice under subsection (1), the occupier may prefer an appeal to the Collector or to such other officer as the Provincial Government may appoint.

(3) On receipt of the appeal under sub-section (2) the Collector or other officer, as the case may be, may extend the time specified in the notice under sub-section (1) and shall, after giving the occupier an opportunity of being heard, pass such order on the appeal as he thinks fit.

(4) An order passed under sub-section (3) of this section shall be final and conclusive and shall not be liable to be called in question in any court.

7. *Failure to comply with notice under section 6 and power of Inspector to carry out measures*—(1) If any occupier upon whom a notice has been served under sub-section (1) of section 6 does not comply with such notice within the time specified therein, or if an appeal has been preferred under sub-section (2) of section 6, does not comply with the order passed on such appeal within the time specified in such order, the Inspector may carry out at the expense of the occupier the preventive or remedial measures mentioned in such notice or order.

(2) The costs of any preventive or remedial measures carried out under sub-section (1) shall be payable by the occupier and shall be recoverable from him as an arrear of land revenue.

(3) Any such occupier may, within thirty days from the date of the first demand of such costs from him, prefer an appeal to the Collector or to such other officer as the Provincial Government may appoint in this behalf on the ground that—

(i) the costs include charges for items other than the cost of labour, material or use of implements, or

(ii) the charges for labour or material or use of implements are unreasonably high.

(4) On receipt of the appeal under sub-section (3) the Collector or other officer appointed by the Provincial Government shall, after giving the occupier an opportunity of being heard, pass such orders thereon as he thinks fit.

(5) An order passed under sub-section (4) shall be final and conclusive and shall not be liable to be called in question in any court.

8. *Duty of certain village officers to report appearance of insect pests, plant diseases or noxious weeds*—(1) If any insect pest, plant disease or noxious weed appears in any village adjoining a notified area, the Patwari or Lambardar of such village shall forthwith report the fact to such officer as the Provincial Government may appoint in this behalf.

(2) The officer aforesaid shall on receipt of such report and after making such further inquiry as he may deem necessary forward it to the Provincial Government through the Director of Agriculture with his remarks thereon.

9. *Offences and Penalties*—(1) Whoever removes any plant, earth, soil manure or other thing in contravention of the directions contained in a notification issued under section 3 shall, on conviction by a magistrate be punishable with fine which may extend to Rs. 50 or in default to simple imprisonment for a period not exceeding ten days.

(2) Any occupier who fails to comply with a notice given under sub-section (1) of section 6 or with any order passed on appeal under sub-section (3) of section 6 shall on conviction by a magistrate, be punishable with fine which may extend to Rs. 50 or in default to simple imprisonment for a period not exceeding ten days.

(3) Whoever having once been convicted of an offence under sub-section (1) or (2) of this section is again convicted of an offence under either of these sections shall be punishable with fine which may extend to Rs. 250 or in default to simple imprisonment not exceeding one month.

PART III—General

10. *Appointment of Inspectors*—The Provincial Government may, by notification in the Official Gazette, appoint persons as Inspectors for such local areas as may be specified in the notification.

11. *Bar of suits or other legal proceedings*—(1) No suit, prosecution or legal proceedings shall lie against the Provincial Government or any officer of the Provincial Government in respect of anything in good faith done or intended to be done under this Act or for any damage to property caused by any action taken in good faith in carrying out the provisions of this Act.

(2) No prosecution under this Act shall be commenced without the previous sanction of the Collector or other officer authorised by the Provincial Government in this behalf nor after three months from the date of the commission of the alleged offence.

12. *Delegation of powers*—The powers conferred on the Provincial Government under this Act, may, with the exception of the powers under section 13, be delegated by the Provincial Government to any officer.

13. *Rules*—(1) The Provincial Government may, from time to time, make rules for the purpose of carrying into effect the provisions of this Act.

(2) In particular and without prejudice to the generality of the foregoing provisions, such rules may be made for all or any of the following purposes:—

(a) the form or manner of giving notice under section 3;

(b) the manner of making an inquiry under section 5;

(c) the method of publication of description of insect pests, plant diseases, noxious weeds and the treatment to be followed;

(d) the qualifications required of the Inspectors;

(e) prescribing the officers to whom an appeal may be made and procedure to be followed in such appeal;

(f) prescribing the notices and methods of services thereof, and registers needed for the effective working of the Act; and

(g) generally to carry out the purposes of this Act.

(3) The rules made under this section shall be subject to the condition of being made after previous publication.

KARTAR SINGH CHAWLA
Deputy Secretary to Government of East Punjab
Legislative Department

NOTES AND NEWS

(i) Importation of Tobacco by Air into India Prohibited

According to Government of India's Notification No. F.6-25/53-Dte.I, dated the 2nd April 1953, unmanufactured tobacco either raw or cured cannot be imported into India by air except from Burma and the Kalat State. Transit of such tobacco through India by air or its transhipment is allowed provided (a) if such tobacco is accompanied by an official phytosanitary certificate also stating the freedom from the tobacco moth (*Ephestia elutella*) or that the pest does not exist in the country of origin and (b) it is packed in a container in such a way as not to allow any insect to reach or leave it and the container is not opened in any part of India.

(ii) Control of "Fireblight", a Bacterial Disease of Fruit Trees with Antibiotic Drugs*

Dr. Robert N. Goodman of the University of Missouri has reported that "Fireblight", a bacterial disease that has killed millions of fruit trees over the past 100 years, can be stopped with minute quantities of antibiotic drugs in a water spray. Dr. Goodman has carried out successful control experiments with a combination of Streptomycin and Terramycin on apple trees.

(iii) Soil Fumigation Carries Risk of Injury to Good as well as Bad Organisms†

Experiments conducted by James P. Martin and J. O. Ervin, University of California, Citrus Experiment Station, Riverside, show that good as well as bad soil organism may be destroyed by soil fumigation. They have found the total forms in the soil may be sharply reduced. Among those forms which are reduced in number or destroyed may be organisms needed for soil development and plant nutrition.

Insects and nematodes are easily destroyed. Other organisms including fungi and bacteria, are reduced or destroyed, depending on the strength of the fumigation treatment and other factors. In the experiments conducted by them after the initial reduction of soil organisms had stopped, it was discovered that there was a rapid increase in the number and forms of bacteria and Streptomycetes, a group of organisms halfway between the bacteria and fungi. Exactly the opposite was true of the soil fungi. Fewer species became established after the fumigation than were originally present. The importance of soil fungi in carrying out their normal function makes it advisable to proceed with caution in the matter of soil fumigation.

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* Extract from "Seed World", Vol. 73, No. 6, p. 44, 1953.

† Extract from "Crops and Soils", Vol. 6, No. 1, p. 19, 1953.

(iv) New Insecticide Plant in Holland

Scheduled for immediate construction and for completion by mid-1955 a new plant at Pernis (Rotterdam) refinery in Holland will make available for world wide distribution two new insecticides, Aldrin and Dieldrin, which have already had international success.

In 1952 locust campaigns in Pakistan and Iraq, Aldrin was used both aerially as a spray and as the toxic component in ground bait and proved cheaper and more effective than any other insecticide. This summer Dieldrin was responsible for saving $75,000,000 rice crop in California, U.S.A. from the depredations of rice leafminer, during the biggest infestation in the area since 1922. The insect had damaged already 50,000 acres of rice when experts were called in. Within a few days more than half the Californian rice acreage had been sprayed with Dieldrin, selected after on-the-spot trials as being the most effective destroyer of this pest and the costly crop was saved at a cost of as little as $3.50 an acre.

(v) Rating-scale for insecticides†

With the obvious qualification that different orders of effectiveness might relate to specific pests and conditions, the comparison in potency and residual persistence of nine insecticides, mostly recently introduced, made by J. R. Busvine, D.Sc., and Ruth Nash, B.Sc., of the London School of Hygiene and Tropical Medicine (Keppel Street, London, WCI) helps to tidy up a mass of information which has accumulated too fast to be assimilated.

In potency gamma-benzene hexachloride comes first, followed by Dieldrin. Aldrin and pyrethrins are bracketed next in order, followed by Chlordane, DDT, Pyrolan and Allethrin (all of roughly equal effectiveness), and finally Toxaphene. In the order for residual activity (upto six months) Dieldrin, DDT and Toxaphene share first place, followed by Pyrolan. Third rank is shared by gamma-BHC, Chlordane and Aldrin, after which some Allethrin and pyrethrins. Dr. Busvine's and Miss Nash's investigation, shows Pyrolan to be quite as toxic to two resistant strains of housefly as to normally susceptible ones, Allethrin to be markedly less effective than pyrethrins, and dieldrin to be most promising out of all the compounds, examined by reason of its high ranking in both scales.

(vi) Protection of Grain by Asphyxiation of Insect Pests‡

According to the report of the Food Manufacturers' Conference, workers in Argentine had discovered that when infested grain was stored in large under-ground pits, which had been leak proofed for carbon dioxide, with roofing felt and bitumen, the respiration of the insects caused a rapid rise in carbon dioxide concentration and corresponding fall in oxygen and the insects died by their own efforts.

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*Extract from "Chemistry and Industry", No. 40, October 3, 1953, p. 1054.

†Extract from Science News Letter No. 122 from Indian Scientific Liaison Office, London, dated September 4th, 1953.

‡Extract from Science News Letter No. 26, October 2nd, 1953 of Scientific Adviser, Indian High Commission, London.

Trial pits had been built and tested in parts of E. Africa with promising results and it was likely that the method would be developed on a full commercial scale.

Another method by which the need for insecticide could be avoided, or at least minimised, was the self-sterilisation of bagged grain. By stacking bags in the tropics as tightly as possible in order to conserve all the heat that might be engendered, much of the insect life in the centre of the stack was killed, or was driven to the periphery where contact insecticides could be used in the form of dusts applied to the outer bags. This method has been successfully used on a large scale in E. Africa.

(vii) Gamma Rays Kill Food Pests*

Six types of insects which infest stored and packaged foods have been killed by irradiation with nuclear fission products in doses much smaller than would be required for bacterial sterilisation. G. C. Hassett and D. W. Jenkins, of the Chemical Corps Medical Laboratories, U. S. Army Chemical Centre (Maryland), who report these experimental results, conclude that if it proves economically practicable to sterilise drugs by irradiation with isotopes, it should be feasible to destory insect pests by this means. A dose of only 64,400 roentgen units killed all the insects in irradiated samples, and 16,000-32,00-r inhibited their reproduction: by contrast, 1,000,000-r, or even higher dosages are needed for bactericidal action.

Cobalt-60 was the source of gamma radiation successfully employed by Messrs. Hassett and Jenkins in the control of the Lesser Grain Borer, Flour Beetle, Rice Weevil and Larder Beetle. Preliminary study has been given to the design of equipment for passing food materials on a conveyor through a radioactive field, and advice is offered on shielding to ensure operatives' safety, but the proposal appears not to have reached the stage of commercial evaluation.

(viii) A New Spraying Technique[1]

The old style high-volume spraying is dying now because of the trouble and expenses of transporting huge quantities of water necessary and because the heavy spraying machines churn up the surface of the earth. To overcome these drawbacks, conventional low-volume spraying equipment was introduced using as little as 5—10 gallons per acre and depending on fine atomisation to provide the necessary coverage. Subsequently as a variant, air blast apparatus came into use which swept the atomised insecticides in jets of fast moving air over and through the crop. Even with these new drawbacks arose. Often the insecticides did not reach lower surfaces of leaves and the efficiency of treatments was considerably reduced by winds blowing

*Extract from item 1510 of Science News Letter No. 96 from Indian Scientific Liaison Officer, London.

[1]Extract from "World Crops", Vol. 5, No. 7, p. 294 (1953).

the pesticides away from the plants. Bayer Farbenfabriken of Leverkusen, Germany, have recently patented a means of overcoming some of the defects in low-volume spraying. In its using conventional components, a jet of air is directed near the crop either horizontally or obliquely downward; the insecticide is atomised into the jet of air so that mixing occurs outside the machine. Because emission takes place at crop level and due to the air jets' agitating effect on the leaves, both the leaf surfaces are dosed adequately while casual wind currents have no effects on the movements of the atomised pesticide.

(ix) Coated Insecticides[2]

Recently Pest Control Ltd. of Cambridge, England has patented the proposal to coat insecticidal powders with cellulose or alginates and this may prove an important and further step towards minimising the risk of killing predators. Wettable powders prepared in this way have no contact efficiency, but the aim is to kill biting insects, especially caterpillars which devour foliage. Leaf-eating insects have enzymes which digest cellulose in an alkaline medium within the alimentary canal; by contrast predatory insects carry enzymes which digest protein and fats in a predominately acid medium. Thus in the case of the cellulose-coated powder grains only the pests will be able to digest away the protective layer and liberate the poison. With the alginate-coated particles the release mechanism is somewhat different. Alginic acid is weakly acidic and dissolves readily only in slightly alkaline solutions, thus the acid gut-juices of the predatory insects will not dissolve away the coating to the insecticide particle although when they meet the alkaline juices within a caterpillars' alimentary canal this protective coating will dissolve with the consequent release of the poison.

(x) A New Sticker for Copper Fungicides[3]

Cuprous oxide or copper oxychloride is reported to be replacing the older fungicides like Bordeaux or Burgundy mixtures. Both the oxide and oxychloride being insoluble, for the purposes of spraying they are ground to a particle size passing 100—150 B.S. Mesh and suspended in the spray-wash. To prevent their leach-off leaf surfaces, stickers, such as blood albumen, skimmed milk, gelatin, etc., are used, as neither size nor gelatine dissolve easily into cold water solution. Pest Control Ltd. of Cambridge, England has found a novel method. They sprayed dried gelatine solutions and ground the dry matter to pass 150 B.S. Mesh. When added at the rate of 1 lb. per 100 gallons of spray-wash, this sticker very readily dissolves. They also found that copper particles might be coated with gelatine and that the resultant dry powder was easy to mix with water. For preparing coated copper fungicides, 5 lb. of the oxychloride are suspended in a gallon of water, to this is added ½ lb. of sodium tripolyphosphate after the addition of ½ lb. gelatine dissolved in the water. The suspension is dried over steam-heated rollers and reduced to pass the standard size. The copper, gelatine mix and gelatine coated copper grains are claimed to take up and disperse water better than materials prepared by other means.

[2 3]Extract from "World Crops", Vol. 5, No. 7, p. 294, (1953).

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